UNIVERSITY OF HOHENHEIM

focus

Underpinnings – Requirements – Effects
of Undergraduate Research Experiences

URE

International Conference

June 5 – 7, 2019, University of Hohenheim, Stuttgart, Germany

Humboldt reloaded

www.uni-hohenheim.de

Imprint

Prof. Dr. Martin Blum
Head of Humboldt reloaded
E humboldt-reloaded@uni-hohenheim.de

Conference Management
Dr. Kerstin König
T +49 711 459 23764
E focus_URE@uni-hohenheim.de

Type & Layout
Claudia Preker, Valentin Funk

Images
University of Hohenheim: Daniel Jüptner (p. 2), Astrid Untermann (p. 2),
Sven Cichowicz (p. 5)

focus URE

Underpinnings – Requirements – Effects
of Undergraduate Research Experiences

International Conference

June 5 – 7, 2019, University of Hohenheim, Stuttgart, Germany

Contents overview

President's greetings

Prof. Dr.
Stephan Dabbert

President of the University of Hohenheim

Ladies and gentlemen, dear guests,

I warmly welcome you to the University's international symposium "focus URE. Underpinnings, Requirements, and Effects of Undergraduate Research Experiences".

Our University's campus is located in Stuttgart, and we focus on cutting-edge topics based on a 200-year tradition of working to provide solutions for society's most urgent problems. The integration of agricultural and natural sciences together with social, business and economic sciences gives us a special profile that is one-of-a-kind in the state of Baden-Württemberg. The University of Hohenheim stands for excellent research and teaching that is both inspiring and research-based in our three key research foci: Bioeconomy, Global Food Security and Ecosystems, and Health Sciences. For this purpose, we have global networks and cooperate internationally with around 100 partner institutions.

Educating students is one of our highest priorities, and we believe that integrating research in teaching is the prerequisite for excellent academic teaching. Around 9,500 students study in more than 40 Bachelor's and Master's degree programs in Hohenheim. With the award-winning project "Humboldt reloaded", the University has positioned itself as one of Germany's top higher education institutions for research-based learning already in the Bachelor's programs.

Over the past 10 years, a permanent place has been created in Hohenheim for research-based learning – as a term and as a conscious practice in university teaching. Today, research-based learning is an important profile characteristic of the University of Hohenheim. Especially with "Humboldt reloaded", research-based learning in Bachelor's programs has gained more prominence and is a regular part of studies for both students and lecturers. There are numerous further education offers and information materials for students and lecturers regarding competences in this area. Since 2011, small research projects have been offered from the departments in which Bachelor's students can voluntarily participate in ongoing research processes.

We would like to share our good experiences with this form of learning with you, and I look forward to your experiences and reports on your work on research-based learning. I also look forward to hearing your answers to the question of how research-based learning can function successfully for the various groups involved – students, lecturers, and representatives of higher education institutions.

I wish you an inspiring event and interesting conversations.

Welcome message

Dear guests,

It is with great pleasure that I welcome you at Hohenheim University to participate in our International Conference *focus URE. Underpinnings, Requirements, and Effects of Undergraduate Research Experiences*. Our project 'Humboldt reloaded' has started in 2011 and has offered about 50 percent of our bachelor students the opportunity to pursue research projects during the second year of their study programs. During this time, a Germany-wide network on research-based learning and teaching has been established in which we very actively participate. We profit enormously from this community, which has been facilitated by the federal funding of Humboldt reloaded and like projects at other universities. Though learning cultures and general requirements may differ widely, we are very eager to learn about and discuss international experiences and standards, which is one of the goals of this Meeting.

Following a theoretical layout of rationales for orienting university-based learning and teaching at state-of-the-art research, we will elaborate on three subject areas during the Meeting:

The *Underpinnigs* session will highlight the cognitive, meta-cognitive, motivational and affective background of learners and teachers as important determinants of the learning process; the general *Requirements* will be discussed with the help of successful examples of projects in Germany and abroad; while the third subject area *Effects* will investigate if and how short- and long-term impacts can be measured in a qualitative and quantitative manner.

Besides program and abstracts, this Booklet lists central questions in the respective chapters, which may serve as guidance cues. Plenary lectures and poster sessions will be complemented by round-table discussion groups as well as a task force, consisting of the three colleagues, Cornelia Frank, Philipp Pohlenz and Peter Tremp. They will follow the meeting to compose a Hohenheim Memorandum, which aims at summarizing the main results of presentations and discussions. We hope that this Memorandum will send a signal nationally and internationally to implement research-based learning and teaching broadly in study programs, beginning already at the Bachelor level. This Memorandum will be presented, discussed and finalized at the end of the Meeting on Friday morning.

I like to thank all participants for their contributions, the Humboldt reloaded team for their enormous efforts in organizing this conference, as well as many more supporters from Hohenheim University and our funding agency, the Federal Ministry of Education and Research. Special thanks go to the members of our advisory board, Gabi Reinmann, Ludwig Huber and Peter Tremp, as well as to the members of the task force.

I am very much looking forward to three days of intensive scientific exchange and lively discussions. I wish you all an enjoyable and profitable stay at Hohenheim University!

Prof. Dr.
Martin Blum

University of Hohenheim,
Head of
Humboldt reloaded

Conference program

Wednesday, 6/5/2019

9 am – 12 am
Arrival & registration

12 am – 1 pm
Informal get-together with snacks

1 pm – 1:30 pm
Stephan Dabbert, Martin Blum:
Welcome and general introduction

1:30 pm – 3:30 pm
Keynote (in German, with translation)
Gabi Reinmann, Ludwig Huber & Peter Tremp:
Research-based learning – three lines of argument for justification
commented by Carolin Kreber

3.30 pm – 4 pm
Coffee break & socializing
Room to engage in hot discussion

Underpinnings

How does learning occur and what can we conclude for URE?

4 pm – 4:30 pm
Maja Flaig:
Power, promises and pitfalls of prior knowledge for learning in higher education – How can we put research into practice?

4:30 pm – 5 pm
Sarah Rose Cavanagh:
The Spark of Research-Based Learning: Energizing Students with the Science of Emotion and Motivation

5 pm – 5:30 pm
Tina Seufert:
Cognitive, metacognitive and motivational challenges of URE

5:30 pm – 6 pm
Laura van der Aar:
Educational decision-making in adolescence: the role of behavioral and neural correlates of academic self-concept and self-esteem

6 pm – 7 pm
Break

7 pm
Dinner

7:45 pm
EduVote discussion

Thursday, 6/6/2019

9 am – 9:15 am
Opening of the day & introduction

Requirements

What does URE require? Different formats of URE from USA, Germany and other countries

9:15 am – 10:00 am
Key Note
Dilly Fung:
What does URE require to succeed?

10:00 am – 10:30 am
Ellen Carpenter:
What URE requires from the perspective of the National Science Foundation

11:00 am – 11:30 am
Ellen Bastiaens:
What does URE require to succeed?
Lessons learned from Maastricht University

11:30 am – 12:00 am
Anna Häring:
Creating undergraduate project-based learning opportunities - embeddedness, cooperation and coordination

12:00 am – 12:30 pm
Dominique Galli:
Benefits and challenges of team-based interdisciplinary undergraduate research experiences

12.30 am – 1.45 am
Lunch at Mensa

1.45 pm – 3 pm
Workshop:
What works when for whom?

3 pm – 3:30 pm
Plenum: Wrap up

3:30 pm – 4 pm
Coffee break

Effects / Evaluation
What are the effects of URE and how to measure them? Focusing on approved means for measuring effects of URE

4 pm – 4:30 pm
Rosalie Richards:
Raising the bar: Intentional URE design to elevate student competencies

4:30 pm – 5 pm
Julia Rueß & Wolfgang Deicke:
Does research-based learning facilitate the development of research competencies?
Results from a pre-post analysis in 74 university courses

5 pm – 5:30 pm
Ines Langemeyer:
Argumentation and scientific reasoning as didactical means

5:30 pm – 6 pm
Anne Maria Stefani & Johanna Sand:
Unpacking the black box URE –
A holistic analysis on the effects of undergraduate research experience using the example of Humboldt reloaded

6 pm
Finger Food with postersession

6:45 – 7 pm
String quartet of the Hohenheim Symphony Orchestra

Friday, 6/7/2019

9 am – 9:15 am
Opening of the day & introduction

9:15 am – 10:30 am
Keynote
Marcia Linn:
Mechanisms for URE Success

Followed by short commentaries; conclusion and discussion

10:30 am – 12 am
Cornelia Frank, Philipp Pohlenz, Peter Tremp:
Memorandum & closing

12 am – 1 pm
Lunch at Mensa

Departure


How does learning occur and what can we conclude for URE?
What can we deduce from pedagogical and psychological theories of learning for a successful implementation of URE?
How important are cognitions, motivations, and affects for succeeding learning processes?
Which neurophysiological processes during learning favor learning in the URE format, which hamper learning by URE? How can we apply this knowledge for URE?
What – if any – are do's and dont's in URE from the pedagogical, psychological, and neurophysiological perspectives?
Which teaching competences qualify academics particularly to successfully mentor students in URE?
What does URE require?
What are the learning goals, requirements, challenges, and achievements of particular disciplinary and interdisciplinary formats of URE?
What are the intended and non-intended outcomes of these formats?
Which lessons learned on succeeding and hampering factors for disciplinary and interdisciplinary URE can we deduce from these practical experiences?
What are the recommendations for successful URE, understood as strengthening the student's research competences?
What additional challenges arise in interdisciplinary formats and how can they be met?

Key questions of the conference

When and how does URE succeed for whom?

What are the effects of URE and how to measure them?

How can we gain solid empirical insights on the effects of URE?

What type of impact models is suitable for identifying strengths and weaknesses of URE?

Which type of research competences are we measuring?

What are appropriate procedures of data acquisition?

What kind of data should be collected at what time points during the process?

Which positive and – if so – negative effects arise during URE?

Underpinnings

How does learning occur and what can we conclude for URE?

What can we deduce from pedagogical and psychological theories of learning for a successful implementation of URE?

How important are cognitions, motivations, and affects for succeeding learning processes?

Which neurophysiological processes during learning favor learning in the URE format, which hamper learning by URE? How can we apply this knowledge for URE?

Which neurophysiological processes during learning favor learning in the URE format, which hamper learning by URE? How can we apply this knowledge for URE?

What – if any – are do's and dont's in URE from the pedagogical, psychological, and neurophysiological perspectives?

Which teaching competences qualify academics particularly to successfully mentor students in URE?

Contents

Prof. em. Dr. Dr. h. c.
Ludwig Huber

Bielefeld University, Faculty of Educational Science

Keynote

Research-based learning – three lines of argument for justification

Prof. Dr.
Gabi Reinmann

Hamburg University, Hamburg Center for University Teaching and Learning (HUL)

Research-based learning is the postulate of a radical educational renewal: Academic study should mirror the attitudes and practice of research. Because research-based learning is associated with great challenges for all those involved, it requires a strong justification, which at the same time should set standards for implementation. We discuss three lines of argument:

Theoretical-normative

The goals of academic study are defined by «Bildung durch Wissenschaft» ("education through scholarship") on the one hand, and «education for employability» on the other. It is discussed whether and how research-oriented learning in its various forms might, and perhaps even should, contribute to one or the other of these goals and do so more than other forms of learning, for example imparting general competences, developing reflexivity or a 'research attitude'.

Empirical evidence-based

Approaches such as research-based learning are under pressure to succeed and "prove" their effectiveness. It is analyzed which (sub) disciplines can contribute insights and how

"Despite a long tradition, highly valid rationale and widespread practices: Research-based learning as an originally radical postulate presents a problem which is still unsolved."

Prof. Dr.
Peter Tremp

University of Teacher Education Lucerne, Centre of University Didactics

empirical results can be evaluated for practical use. Examples from empirical studies will show that the recommendation to have greater flexibility in teaching can be empirically supported, but that recommendations for individual teaching decisions cannot be derived directly from research.

Institutional-practical

Universities can be understood as the institutional form of a general concept of academic education, and its concrete realizations as specific characteristics. Despite different emphasis, many universities claim to follow the guiding principle of research-based learning. The question is what makes research-based learning an attractive guiding formula for different university conceptions.

The three lines of argumentation provide indications of the extent to which research-based learning is meaningful, possible and necessary. Our input recalls both, the radical nature of the postulate and the need to communicate within the teaching-learning communities.

In the commentary of our discussant, the term "ethos" is used to describe the maxims that shape this practice of research-based learning.

Discussant

Prof. Dr.
Carolin Kreber

University of Edinburgh, Moray House School of Education, Higher Education Research Group

"Institutionalizing URE means to me putting educational research into practice."

Power, promises and pitfalls of prior knowledge for learning in higher education – How can we put research into practice?

Dr. Maja Flaig

University of Trier, Educational Psychology

The acquisition of domain-specific expertise, highly specialized and complex knowledge and skills often challenges learners in higher education. Learners who meet these challenges generally show high achievements, e. g., excellent grades, and have low tendencies to drop out of their respective study programs. During the last years of educational research many single studies and an increasing number of meta-analyses have tried to determine the characteristics of successful higher education students and found that prior achievement has one of the strongest influences on later learning. In line with the knowledge-is-power hypothesis, it is expected that the effect of prior academic achievements on later achievements is not only mediated by motivational and cognitive capacities, such as self-regulation strategies and intelligence, but also prior knowledge. Students who possess more prior knowledge in a specific domain can relate new information more easily to information already stored in long-term memory, leading to better integrated and more extensive structures of knowledge. These promises of prior knowledge for later learning are well established by empirical evidence coming from different educational settings and knowledge domains, such as psychology, physics, and mathematics. However, prior knowledge does not only hold promises for later learning but also pitfalls as students' prior knowledge is necessarily incomplete and sometimes even incorrect. These pitfalls have been investigated in studies coming from research on conceptual change and misconceptions in and outside higher education.

In the current talk, empirical findings concerning the power, promises and pitfalls of prior knowledge for later learning and academic achievement are presented. The talk will extend on these findings by discussing their practical implications for higher education teaching concerning the question of how teachers can make use of 'the power of (prior) knowledge' for student learning.

"URE is successful when students feel energized by their ability to contribute to knowledge, supported by their mentors, and deeply curious about the outcome."

The Spark of Research-Based Learning: Energizing Students with the Science of Emotion and Motivation

Prof. Dr. Sarah Rose Cavanagh

Assumption College, Department of Psychology & Center for Teaching Excellence

Traditional views of education assume that reason should reign over emotion, and that the classroom should be a quiet, dispassionate space where students and instructors impartially engage with facts, figures, and theories. However, the field of education is beginning to awaken to the power of emotions to capture attention, mobilize efforts, and enhance memory. Undergraduate research is uniquely poised to elicit emotions important for motivation and also for learning: creating a sense of intellectual autonomy, developing relationships with faculty, and enlivening curiosity.

"URE is successful when learners invest in integrating information and if they reflect on what they do."

Cognitive, metacognitive and motivational challenges of URE

Prof. Dr.
Tina Seufert

Ulm University, Department of Learning and Instruction

Learning is a complex process of information processing, which very often comes along with the necessity to integrate multiple sources of information. Also in research settings learners will have to integrate information like data sources, environmental parameters, design concepts, graphs etc. Only when learners are able to link this information into one coherent mental representation, they will understand and thus profit from research experiences in the long run.

In my talk I will first highlight the cognitive affordances of this coherence formation process, including the different steps of understanding the single information sources as well as the overall concept. Learners can use strategies to apply these steps successfully. They can for example identify corresponding elements in a graph as well as in the data table and mark them. Thus, also teachers could activate these mapping strategies. They could articulate correspondences and thus guide learners' attention to these links. They could also use marks, like colors or arrows when presenting research results.

However, to profit from research experiences as a learning strategy itself, learners have to reflect their behavior. Thus, the second main aspect of my talk is about metacognitive strategies. Planning, monitoring and regulation are crucial to improve during learning by research. Moreover, learners could reflect about the concept of research and the function of research experiences for learning. Thus, they gain knowledge about how they learn and how knowledge and competences are built.

The third and maybe most crucial aspect that will be discussed is learners' motivation while doing research for learning. Learners will only then invest in the necessary cognitive and regulatory steps when they are willing to do so. As the research setting is per se characterized by a greater amount of autonomy and also more direct feedback it has the potential to be motivating in itself. However, I will present several strategies for teachers to motivate students to invest in all the necessary steps of learning by research.

"URE is successful when students have gotten a better understanding of what it means to be a researcher and can decide if this fits with their interests, abilities and career goals."

Educational decision-making in adolescence: the role of behavioral and neural correlates of academic self-concept and self-esteem

Laura van der Aar, M.Sc.

Leiden University, Institute of Psychology, Developmental and Educational Psychology

An important challenge for adolescents is to make future-oriented academic choices that match their identity, such as choosing a major in higher education. However, educational decision-making is a complex process and many adolescents encounter difficulties which can result in dropping out, changing programs or not making a decision at all. Individual factors such as how adolescents think about – and evaluate themselves could play an important role in this decision-making process. In this talk, I will present two studies in which we examined the role of behavioral and neural correlates of academic self-concept and self-esteem in relation to problems adolescents can experience with educational decision-making.

In the first part of my talk, I will highlight the role of academic self-concept in adolescents' motivation to start the orientation process for a future study (N = 48). Here, we found that academic self-evaluations were a more important predictor for problems with study orientation compared to subjective academic importance or academic performance. On a neural level, we found that individual differences in the positivity of academic self-evaluations were reflected in increased precuneus activity, and that this precuneus activity was related to problems with study orientation.

In the second part of my talk, I will focus on characteristics of adolescents who experienced clear difficulties with educational decision-making; they dropped out of higher education or stayed undecided after high-school. We compared 38 adolescents struggling with educational decision-making with 46 peers who already successfully transitioned into higher education. Results showed that adolescents struggling with educational decision-making reported lower levels of self-esteem, and that lower self-esteem was associated with less activity in the medial prefrontal cortex when thinking about the self.

Together, these results suggest that healthy self-esteem levels as well as a positive academic self-concept could be important factors for the ability to make a well-suited educational choice. We are currently testing these questions in an intervention design.

Requirements

What does URE require?

What are the learning goals, requirements, challenges, and achievements of particular disciplinary and interdisciplinary formats of URE?

What are the intended and non-intended outcomes of these formats?

Which lessons learned on succeeding and hampering factors for disciplinary and interdisciplinary URE can we deduce from these practical experiences?

What are the recommendations for successful URE, understood as strengthening the student‘s research competences?

What additional challenges arise in interdisciplinary formats and how can they be met?

Contents

"Undergraduate research needs to be framed as part of a holistic, strategic commitment to enhancing higher education for the global common good."

Keynote

What does URE require to succeed?

Prof. Dr. Dilly Fung

London School of Economics and Political Science, School of Public Policy & Pro-Director for Education

In addressing the challenges of engaging undergraduate students with research, we need first to address some fundamental questions about the purpose of higher education. How are we characterising 'good' education for our students? What are the relationships between the varied kinds of research we undertake, within and across disciplines, and students' learning (Fung, Besters-Dilger and van der Vaart 2017)? Is the purpose of higher education to provide individuals with what they need to succeed in a competitive world, or is it advancing the global common good? By integrating research and student education more readily, can we achieve both?

We will then consider what is needed in practice for research-based education to succeed. Using the Connected Curriculum framework (Fung 2017), which has been adopted as institutional policy at UCL (University College London) and is now influencing practice in research-intensive institutions globally, we will look at the steps needed to effect meaningful change. These include framing an institutional strategy, working in partnership with students to develop opportunities for all, and ensuring that faculty are appropriately rewarded (Fung and Gordon 2016).

We will finish with time for questions and comments: how relevant are these issues and approaches for delegates at the "focus URE" Conference?

Literature

Fung, Dilly (2017) A Connected Curriculum for Higher Education London: UCL Press https://www.ucl.ac.uk/ucl-press/browse-books/a-connected-curriculum-for-higher-education

Fung, Dilly, Besters-Dilger, Juliane and Van der Vaart, Rob (2017) Excellent education in research-rich universities. http://www.leru.org/files/publications/LERU_Position_Paper_Excellent_Education.pdf

Fung, Dilly and Gordon, Claire (2016) Rewarding educators and education leaders in research-intensive universities https://www.heacademy.ac.uk/sites/default/files/rewarding_educators_and_education_leaders.pdf

"Institutionalizing URE means a commitment from faculty, staff, and administration to identifying, implementing, and supporting evidence-based educational practices."

What URE requires from the perspective of the National Science Foundation

Dr. Ellen Carpenter

National Science Foundation, Division of Undergraduate Education, Alexandria (Virginia)

Undergraduate research experiences are widely recognized as key elements in helping to develop a science identity in undergraduate students. These experiences are also important in retaining these students in STEM (editor's note: short for the academic disciplines Science, Technology, Engeneering, and Mathematics) majors and stimulating their interest in STEM careers. In the United States, undergraduate research experiences have traditionally followed an apprenticeship model, where students approach individual faculty members to arrange for placement in their laboratories. However, with the recognition of the importance of these activities, there is substantial interest in developing and applying nontraditional models, so that increasing numbers of students can engage in undergraduate research. The National Science Foundation, an independent Federal agency that supports approximately 27 % of the basic research conducted in the United States, considers supporting improvements in undergraduate STEM education, including undergraduate research experiences, as essential to its mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense". A variety of programs, including research grants for developing and improving the effectiveness of STEM education, scholarship programs for low-income students and pre-service teachers, technical education programs, support for summer research experiences, and networks of institutions focused on a common goal are in place to assist in this mission.

"In my opinion, URE needs to enable students to become critical thinkers, to be able to look across the boundaries of their discipline and to be prepared for a life in which a lifelong learning attitude is crucial and in which they are able to work in (culturally) diverse teams."

What does URE require to succeed? Lessons learned from Maastricht University

Dr. Ellen Bastiaens

Maastricht University, EDLAB – The Maastricht Institute for Education Innovation

With research-based learning (RBL) students at Maastricht University (UM) get the opportunity to go into depth into research for a longer period during their undergraduate study phase. At all our faculties, RBL has been implemented as part of the bachelor's curriculum.

In the past 10 years, and depending on the discipline and for instance the programmatic structure different designs for RBL where developed, focusing on three major questions:

1. How to fit research opportunities within the scientific discipline or curriculum;
2. What the research projects should be about, and;
3. How the research projects should be organized.

In the process of implementing RBL, solutions were found through an intuitive and bottom-up process; learning by doing in solving all sorts of practical issues was daily routine. In the early period, there was little room to draw up a more structured approach for undergraduate research. All coordinators showed great creativity, persistence, and courage to implement this program at their faculties; they were willing to step outside their comfort zone. Similarly, both supervisors and students were more than willing to go that extra mile to create an optimal research experience.

After this initial phase of implementation in an intuitive and bottom-up process, more time became available for reflection and theoretical underpinnings. Introducing three different models resulted in – to say the least – a very interesting discussion within UM, because they gave more in-depth insights into how RBL could be designed, and what it means to staff and students.

In my talk, I will position the educational designs for RBL in these models and share our lessons learned after 10 years of experimentation with models for RBL. RBL has found its way at UM as an educational design to stay. In all programs a financial model has been found to facilitate students in conducting academic research. The absolute added value for me lies in the growing influx of former MaRBLe students in renowned master's and PhD programs at UM and other highly ranked universities around the globe. Secondly, this effectiveness becomes clear in the growing list of publications in often, peer reviewed, journals of students, while still being an undergraduate student.

"Institutionalizing URE means to me committing students and educators to impact and adapting educational governance."

Creating undergraduate project-based learning opportunities – embeddedness, cooperation and coordination

Prof. Dr.
Anna Häring

Eberswalde University for Sustainable Development – University of Applied Sciences, Faculty of Landscape Manangement and Nature Conservation, Politics and markets in the agricultural and food economy

The case study of a second semester undergraduate project-based learning opportunity in the Bachelors programme "Organic Farming and Marketing" will be presented. In this case, students are required to work on problems articulated by businesses active in the "Innovation Forum Organic Farming Brandenburg", a forum which brings together farming and food businesses, multiplicators, educators and students with the aim to address innovation needs in the regional food and farming sector. As part of the activities within the "InnoForum", businesses express their innovation needs to a central coordinator, who places projects to undergraduate or graduate degree courses or larger research projects.

In a share fair students select a project and form teams. An interdisciplinary team of university staff accompanies each student team. During a first visit to the business entrepreneurs, students and university staff together define the precise research questions related to the problem raised by the entrepreneur. During the following 14 weeks students have regular meetings with the entrepreneur to learn about the individual background of practices in the respective business and to present and discuss project milestones. Iteratively linked meetings with university staff serve to discuss methodological approaches or results of project related literature reviews, etc. Part of the project based learning approach is a mandatory training on teamwork in non-hierarchical groups, prior to the project. During the project, students receive coaching on how their cooperation within the group and with their "client" is evolving. The conceptual link and skilled coordination of the mentioned elements motivate students and create ownership for the outcomes of their projects.

The approach HNEE has chosen in providing undergraduate students with project-based learning opportunities requires embeddedness in a regional network of farming and food businesses. Long-term investments in trust building cooperation and a careful coordination of all activities are essential. Such investments have resulted in valuable outputs for the cooperating businesses. Over the years, the number of cooperating businesses increased, including alumni who have gone through the URE themselves.

"URE is successful when all stakeholders are fully committed."

Benefits and challenges of team-based interdisciplinary undergraduate research experiences

Prof. Dr. Dominique Galli

Indiana University School of Dentistry, Department of Biomedical Sciences and Comprehensive Care, Division of Biomedical and Applied Sciences

Indiana University-Purdue University Indianapolis (IUPUI) is Indiana's premier urban public research university and the state's health and life sciences hub. The Multidisciplinary Undergraduate Research Institute (MURI) at IUPUI fosters interdisciplinary research in teams of four to six students mentored by two or more faculty mentors. Both mentors and undergraduate students must hail from at least two different disciplines. This co-curricular program is supported by campus funds. MURI was launched in the School of Engineering and Technology. In 2006, it became a campus-wide program, which is housed in the Center for Research and Learning and spans all disciplines. The program runs in two cycles namely during the academic year and in summer. Students earn a stipend and mentors receive small project supply funds. Recent programmatic changes to MURI aim at introducing new students to research as well as ensuring that freshmen and sophomores can participate in research activities. In the past 10 years, 239 projects have been funded involving undergraduate students at all levels of education. 61% of these research projects resulted from collaborations between STEM and/or the health sciences whereas 30% arose from partnerships between a STEM and a non-STEM field. MURI benefits all stakeholders as faculty can reach across disciplines to embrace and test new ideas while students become interdisciplinary thinkers who develop collaboration and leadership skills and are better prepared for careers in new and emerging fields. Our current quantitative and qualitative data support student learning and the development of transferable skills. In addition, 4-year graduation rates for MURI students are significantly above the average graduation rate for IUPUI students. Despite MURI's success, challenges remain as they relate to the commitment of both faculty and students and expansion of the program to disciplines outside of STEM and the health sciences. Lessons learned and future directions will be discussed.

"URE means to me learning deeper and understanding how insights depend on questions and discourse."

SCoRe – A Video-based Crowd Research Experience

How can we enable many students to do research on sustainability? The joint project Video-based Learning through Research on Sustainability: Student Crowd Research (SCoRe) uses Design-Based Research (DBR) as a methodological framework to develop and conduct research on a digital space for inquiry and learning. The sub-project Research-Based Learning carried out at the Hamburg Center for University Teaching and Learning (HUL) focusses on the requirements for research-based learning in a very special context: The students' research activities are supposed to be video-based and embedded in interdisciplinary crowd research projects on sustainability. The digital space, video technology, and the crowd bring possibilities and challenges to research-based learning. We want to take advantage of this context, enable students to understand the research process, contribute to it, and experience the frustration as well as the excitement of research. In addition, we want to gain theoretical insights. The poster presents a working model for conceptualising this specific kind of research-based learning with its decisions to be made throughout the design and research process. It shows some ideas and solutions we would like to discuss with the conference participants.

Alexa Brase

Hamburg Universtity, Hamburg Center for University Teaching and Learning (HUL)

"URE means to me motivating and fascinating students by introducing elements of self-responsible research."

"Kinematics – Self-responsible Experiments" to improve undergraduate research experiences in physics lab courses

Dr. Tobias Breuer

University of Marburg, Physics

Learning how to plan, perform and evaluate lab experiments is a very important part of studying physics and usually happens in hands-on lab courses. These courses allow students to "see and feel" the physical relations that are taught in the lectures and to quantify physical constants by themselves. Very importantly, they also are a very good preparation for self-planned, self-responsible research-experiments as they are performed in B.Sc. and M.Sc. theses. This, however, can only be successful if the participants in such lab experiments are allowed to work self-responsibly. In "classical" lab courses the experimental steps and the desired evaluation are described in detail and the students are expected to follow these instructions precisely. It is our goal to design experiments which allow for self-responsible experimentation. In this contribution, we report on the implementation of the experiment "Kinematics – Self-responsible Experiments" where students use cart tracks to study the laws of impulse conservation. In this experiment, students are neither provided with a detailed instruction guide nor with an "external" physical question. Instead, they can choose their own focus and design individual experiments to study their chosen topics. We observe various different approaches proposed by the students, some of which are very successful, as well as others which do not provide perfect data but hence teach the students a lot about experimental designs. The students are very motivated by the freedom they experience and are, slightly unexpectedly, willing to invest a lot of time in their "own" experiments. By comparing and discussing their approaches with other groups, they furthermore learn about alternative setups and discuss the respective advantages and disadvantages. In our contribution, we present this setup in detail and furthermore briefly present other examples where self-responsible and "free" experiments are implemented in our program.

"URE means to me an opportunity to broaden participation in research for a more diverse population of students."

The impact of broadly relevant novel discoveries on student project ownership in a traditional lab course turned CURE by using a mutant strain of mice

Course-based undergraduate research experiences (CUREs) allow students to conduct research while enrolled in a lab course. CURE experts have called for studies to explore how design features of CUREs, including scientific practices, collaboration, iteration, and discovery/broad relevance, affect student outcomes. Here, we compared the experiences of students enrolled in two versions of an upper-division immunology lab course that characterized the immune system of mice: a traditional lab and a CURE. The only structural difference between the courses was that the traditional lab characterized the immune system of wild type mice, while the CURE characterized the immune system of a mutant strain of mice. Our research aims were to identify whether CURE students experienced more discovery/broad relevance and developed more cognitive and emotional ownership than traditional lab students, and to explore whether students' perceptions of collaboration, iteration, and discovery/broad relevance predicted their cognitive and emotional ownership. We found that CURE students perceived greater discovery/broad relevance and reported higher cognitive and emotional ownership than traditional lab students. Students' perceptions of collaboration and discovery/broad relevance were significantly and positively related to their cognitive and emotional ownership. This work provides insight into the importance of discovery/broad relevance for lab course design.

Dr. Sara Brownell

Arizona State University, Associate Professor in the School of Life Sciences

"URE introduced in stages allow students at least a glimpse of research and teaching staff at least a glimpse of research-based learning."

The learning chain in research-based learning – from research question to final thesis

Dr. Barbara Engler

University of Hohenheim, Humboldt reloaded

Julia Gerstenberg

University of Hohenheim, Humboldt reloaded

The implementation of the ambitious concept of research-based learning is made clearer and less difficult when introduced in stages to students as well as teachers, and when the research process is presented in small units.

The concept described here shows that there are parallels between processes in industry, in the form of the value chain, and in university teaching, especially in research-based learning in the form of a learning chain. In both areas, there is an increase in value or competence in stages. Subdividing the research process into sub-steps is also associated with an increase in knowledge and skills for the students at each stage. Students can also benefit from sub-processes of research-based learning. Teachers who want to try new things in this field can focus on a particular phase by sequencing the research process and providing targeted guidance to students.

Similar to the elements of a research process, the following are proposed as parts of the learning chain: (1) orientation & initiation into study, (2) self-reflection & career planning, (3) adopting knowledge & getting to know theories, (4) learning & practicing scientific methods, (5) accompanying the research process in whole or in part, (6) presentation & reflection of one's own research work, (7) going through the entire research process & independent research. The parts can also be repeated as needed and in a different order. Sequencing provides incentives to approach and deepens researcher learning.

Collaboration among teachers is important, both as a common exchange on developments in the learning chain and as a structural framework in the degree program or in student guidance that can be referred to again and again. Without accompaniment and active connection of the individual elements, the stimulus of the sequenced teaching of research learning cannot develop. Understanding the moderation of this entire learning process among teachers can help create a common approach towards communicating research learning.

"URE means to me … a safe space for trial and error"

The Humboldt reloaded online system – digitalization in real life

To enable Humboldt reloaded (HR) to manage the possible projects, applications, and student participation in a straightforward and effective way, personnel was planned for software development from the very beginning. The software developer's position has been well-integrated into the HR team.

The University of Hohenheim's existing web content management system – TYPO3 – could thus be programmed with a tailor-made software solution. Since TYPO3 is open source, the extension could be developed without any major obstacles.

Despite the team's development capacities, it became apparent that the plans would need to be pared down to the most important key elements. Software development is almost always (!) more time-intensive and work-intensive than initially expected. It helps to orient oneself on the Pareto (80/20) principle: The final 20 % of the work takes 80 % of the effort. The complexity of the project is also often underestimated. Simple, standard processes lead to success more quickly, and special cases should be managed outside the software.

When designing good software development processes, agile methods have proven to be effective. In addition to the necessary flexibility, a clear value orientation also helps with prioritization.

The following best practices can contribute to success:

Close contact between software developers, users, and stakeholders

Using agile methods

Clarity (simplicity, ability to make decisions) about the processes in the project

Coordinating the processes with regard to the software that is to be developed

Reducing the software to the essentials, not trying to use the software to include everything

Integration into existing systems

Valentin Funk

University of Hohenheim, Humboldt reloaded

"Research is a key focus for students from the outset of their study program at Zeppelin University. Problem-oriented and research-based learning facilitate an individualised study program and allows students to explore new horizons in communicating scientific work and practical knowledge."

Research-based Learning 2.0

Kathrin Krautheimer, M.A.

Zeppelin University, Friedrichshafen, Student Research

Research-based learning has garnered much attention in international academic circles as a didactic university concept. Research-based learning is already established as tradition at Zeppelin University and forms an important cornerstone of its strategic mission. In addition to the Zeppelin Project and the Humboldt Year, research-based learning has now been expanded with an international component and is more firmly established in the Master's degree programs. A Methodology Lab has also been designed to further expand individualized consulting in methodology.

"From the student's perspective, URE creates freedom to follow their ideas but also to take responsibility for their own learning experience. From the teachers' perspective, adopting URE to academic teaching challenges the usual role perception of lecturers: Instead of teaching top down with focus on certain knowledge, teachers first and foremost create space that allows students to adopt knowledge practically. It is precisely this renegotiation of the role understanding of teachers and students that I consider as a great opportunity for academic learning and teaching."

Project Laboratories: Courses initiated by students at TU Berlin

The TU Project Laboratories are self-organized courses initiated by students at the TU Berlin. They run for two years and receive both subject related support from a professor and multidisciplinary consulting from kubus – the science shop of TU Berlin. In this project-based learning format, concrete social and ecological problems form the starting point of the learning process. In this context, explorativ learning means that the students adopt specialist knowledge and methodological skills appropriate to the problem they choose to investigate. This approach strengthens the competences for interdisciplinary cooperation among students, often also the exchange with external practice partners.

Dr. Nina Lorkowski

TU Berlin, ZEWK

"URE encompasses a broad range of opportunities that enable students to learn how to do research by addressing authentic questions."

Propelling a Course-Based Undergraduate Research Experience using an Open-Access Online Undergraduate Research Journal

Dr. David Oliver

University of British Columbia, Faculty of Science, Department of Microbiology and Immunology

For the past 18 years, the University of British Columbia has been developing an open access online undergraduate research journal linked to a course-based undergraduate research experience (CURE) in molecular microbiology. In our CURE, students work on teams to derive an original research question, formulate a testable hypothesis, draft a research proposal, carry out experiments in the laboratory, and communicate their results in the Journal of Experimental Microbiology and Immunology (JEMI) (https://jemi.microbiology.ubc.ca/). Our CURE operates in a feed-forward manner whereby student-authored JEMI publications drive research questions in subsequent terms of the course. Progress towards submission of an original manuscript is scaffolded using a series of communication assignments which facilitate formative development. In addition to refereed and non-refereed research articles, JEMI now publishes review articles and technical methods papers. This suite of publications showcases student work and contributes to the culture of excellence within our undergraduate program. The publications also provide graduating students with tangible evidence of research productivity. We will present the current structure and function of JEMI within the context of our CURE. Insights into effective, efficient, and responsible publication of undergraduate research will be discussed. Finally, we will present data summarizing student perceptions of learning associated with participation in a CURE designed around the goal of publication in an undergraduate journal.

"Undergraduate research experiences mean to me … guiding aspiring high potentials to become independent thinkers."

A conceptual approach for initiation and coordination of larger interdisciplinary project groups at URE level

In many professional areas, science and industry, complex solutions today require an interdisciplinary approach, which requires interdisciplinary skills from all involved. In higher education, faculty has to prepare students for their professional life. Undergraduate research experiences (URE) offer a lot of opportunities, apart from scientific skills, to teach professional skills and help young potentials to develop their own personality. Interdisciplinary skills can be developed through interdisciplinary URE.

Within the scope of voluntary participation in URE at an early stage (2nd /3rd semester Bachelors) of academic education, a concept for initiation and coordination of interdisciplinary project groups at URE level has been developed. The focus lies on the development of interdisciplinary skills which build on discipline specific knowledge. Three levels of interdisciplinarity allow teachers to adjust the learning experience to the student´s ability and advancement in the learning progress. The concept is highly flexible regarding project duration, different subjects, and is also applicable at a more progressed level, such as master level. Students are able to gain first experience in interdisciplinary team work and ideally become aware of areas for personal development.

The concept has been tested in different settings and with up to six different departments, with their own scientific fields, cooperating for up to two semesters. Successful settings are those investigating a relevant topic for society and include business enterprises.

Dr. Evelyn Reinmuth

University of Hohenheim, Humboldt reloaded

“URE means to me being very busy and happy.”

Undergraduate Research Projects

Dr. Ina Rust

Leibniz University Hannover, Faculty of Philosophy

The poster reflects on the question „Are undergraduate research projects an ideal form for developing research competence?” It gives an overview of different design characteristics of undergraduate research projects in a big table. It discusses challenges of undergraduate research projects e. g. extremely high advisory load for teachers in order to answer students’ questions and deal with the organizational necessities throughout the lengthy research process. The poster describes a basic dilemma: the more similar the undergraduate research projects are to realistic research, the more they are difficult to teach in particular regarding the time resources for both teaching staff and students. It concludes that despite the above mentioned hurdles that undergraduate research projects are the best way to prepare students for research in their future jobs.

"Undergraduate research experiences mean to me …
being open for challenges and opportunities"

A multidimensional model for mentoring learners in research-based learning

The academic teaching staff plays a central role in facilitating and coaching undergraduate research experiences. While scientific experts are well familiar with imparting disciplinary knowledge and methodological skills, they not necessarily are so with the didactic concept of research-based learning (RBL). Being a complex and challenging format, RBL requires supervisors to reflect the learning and teaching process in multiple directions. In order to support this reflection a multidimensional model was developed to visualize five important dimensions of scaffolding and mentoring RBL. In the context of this model, RBL is regarded as a process itself which aims at developing skills of critical thinking, of creative problem solving and research competencies. In order to achieve this, learning objectives (dimension 1) have to explicitly comprise the development of cognitive but also affective and social skills. To adequately support the learning process, it is important that undergraduates will not be overstrained by the complexity of the research process while experienced students will be given the opportunity to self-dependently develop and pursue a research question. The grade of scaffolding the research topic and the research process (dimension 2) as well as the grade of guidance and supervision (dimension 3) has, thus, to be adjusted according to the learners' needs, but should be shifted towards a higher degree of learners' self-dependence during the course of the curriculum. The latter implies an altered understanding of their roles in the learning and teaching process of both, learners and supervisors. Intended to allow for trial and error, RBL is a time-consuming format. The content (dimension 4) of a RBL project has to match the available time frame and it may be necessary to restrict a project to a less complex research question or to a particular aspect of the research process. The process of acquiring a critical attitude and research expertise exceeds the time frame of most teaching units, but might be divided into sequential, iterative and concerted units with gradually increasing levels of scientific quality (dimension 5). The multidimensional model combines various phases of this process of development and learners' as well as supervisors' perspective. It might thus be a valuable tool for planning single RBL projects or the sequential integration of RBL into a curriculum.

Dr. Natascha Selje-Aßmann

University of Hohenheim, Humboldt reloaded

"The concept of research-based learning supports students during the transition from school to university. They develop a critical attitude, take responsibility of their own learning success and are emboldened to solve problems independently, to have the courage to make mistakes and to take detours."

MINTgrün: undergraduate research experience from the first term

Dipl.-Phys. Sebastian Siewert

TU Berlin, Faculty II – Mathematics and Natural Sciences

The orientation program MINTgrün at the TU Berlin encourages students to test different subjects and try out studying for one year. They attend courses from the regular range of courses at the TU Berlin. In addition, students participate in a so-called laboratory for at least one semester. Students can choose one of 12 different laboratories in a range of fields from construction, chemistry and physics to gender studies. Using the concept of research-based learning, students learn specific skills, like varying programming languages, carrying out a laboratory test or the analysis of historical sources from the bottom up. Students choose a topic of their own interest and come together in working groups. With the help of the laboratories supervisor, they develop a research question that they investigate eventually. They are supported by the teacher in the application of methods or in imparting the necessary basic knowledge. Furthermore, they have to reflect and present their findings and their methodological approach. Although the participation in theses laboratories (4 SWS, 6 LP) requires continuous involvement and collaboration within the working group, the students turned out to be highly motivated in choosing research questions of personal interest, which were often related to sustainability. To adopt the approach of research-based learning to a program for first-year students, a different attitude towards academic teaching is requested. Instead of putting the impartation of specific knowledge into focus, teachers in these laboratories guide students to adopt knowledge by using it for a certain task. On one hand, teachers have to create a space that allows students to learn from mistakes. On the other hand they have direct working groups at crucial points in their research process.

"URE means to me a pedagogy of freedom and partnership."

Ten salient practices for mentoring undergraduate research

This poster identifies ten salient practices of faculty (teaching staff) mentors of undergraduate research as indicated in the extensive literature of the past two decades. The well-established benefits for students involved in undergraduate research are dependent on high-quality mentoring. As more and different types of colleges and universities strive to meet student demand for authentic scholarly experiences, it is imperative to identify what effective undergraduate research mentors do in order to ensure student engagement, quality enhancement, retention, and degree-completion. We offer an original analysis of the literature on UR mentoring in which we identify 10 evidence-based practices of effective UR mentors that apply broadly across disciplines, students, institutions, and mentoring approaches. This poster then contributes to research on teaching excellence by extending the literature pertaining to mentoring pedagogies in undergraduate research settings across diverse social, institutional and disciplinary contexts. New data comes from in-depth interviews with 32 international faculties who have received excellence awards for undergraduate research mentoring. The data reveal a freedom – control dialectic, illuminating the ways in which expert mentors negotiate the desire to create opportunities for students to experience freedom and creativity in research, yet maintain control over the topic, quality and outcomes. The research findings reveal a defining characteristic of award-winning mentors as an ability to establish and sustain a sense of challenge, while maintaining meaningful engagement and a sense of achievement amongst students. The findings show the importance of tailoring practice to the needs of particular student groups, and there are implications for institutional resourcing, as well as mentor training and development.

Prof. Dr.
Helen Walkington

Oxford Brookes University, Humanities and Social Sciences

“URE means to me getting students interested in crossing disciplinary boarders by pursueing their own research projects.”

Studienkolleg am Forum Scientiarum

Dr. Niels Weidtmann

University of Tübingen, Forum Scientiarum

The Forum Scientiarum is an institute of Tübingen University fostering interdisciplinary exchange in teaching and research. Among other activities it organizes a year-long Certificate Program on interdisciplinary relevant topics, the so called “Studienkolleg am Forum Scientiarum”. Twenty student fellows of all disciplines are invited to pursue their own research projects (in groups of five students) and to follow an interdisciplinary course-program as well as a weekly lecture series and different workshops. Each class has its own general topic (in 2018/19 this is “Perception”, before topics were “Disembodied Cognition?”, “Time and Space”, “Language and Cognition”, and many more). At the center of the program is the fellows own research projects. Students are allowed to choose the topic of their (interdisciplinary!) research project by their own. Groups are only loosely supervised but can call for particular help and input of a board of twenty professors of all subjects. Project results are presented at a conference open to the public at the end of the year. Successful papers are published in an anthology edited by the Forum Scientiarum with Tübingen University Press. Student fellows have to apply for the program. For each class twenty participants are selected on the basis of motivation, documented interest in interdisciplinary research, and performance in their regular studies. The program is funded by Udo Keller Foundation.

Effects

What are the effects of URE and how to measure them?

How can we gain solid empirical insights on the effects of URE?

What type of impact models is suitable for identifying strengths and weaknesses of URE

Which type of research competences are we measuring?

What are appropriate procedures of data acquisition?

What kind of data should be collected at what time points during the process

Which positive and – if so – negative effects arise during URE?

Contents

"Analysis of student posters on Research Day show the value of UREs that take advantage of learning sciences mechanisms to increase interest in STEM, use of authentic practices, deep understanding of the discipline, and identity as a scientist."

Prof. Dr.
Marcia C. Linn

Berkeley – University of California, Graduate School of Education, Development and Cognition

Keynote

Mechanisms for URE Success

This talk will analyze how learning sciences mechanisms can inform the design of Undergraduate Research Experiences (UREs) and the assessment of their impacts. Successful UREs address a constellation of dimensions of success including sustaining interest in science, technology, mathematics, and engineering (STEM), building authentic knowledge of science practices, deepening understanding of a science discipline, and creating identity as a scientist. Mechanisms in successful UREs integrate experiences to enable students to develop a coherent perspective on scientific research and the roles they can play in the scientific enterprise. Thus, students build identity as a scientist by self-directed use of science practices to deepen their understanding. They report their results in authentic activities such as presenting at a professional meeting. This talk uses results from analysis of student poster presentations at a research day, to illustrate how UREs with varied designs implement learning sciences mechanisms and achieve integrated progress on the dimensions of success (interest in STEM, use of authentic practices, deep understanding of the discipline, and identity as a scientist).

"In my opinion, institutionalizing URE means to me that purposeful alignment of URE with desired institutional learning outcomes, performance, and behavior must occur early, inclusively, and across the arc of the student experience."

Raising the bar: Intentional URE design to elevate student competencies

Prof. Dr. Rosalie Richards

Stetson University, Faculty Development & Chemistry and Education

Are teachers well-equipped to help students effectively articulate essential competencies and dispositions acquired as a result of participation in undergraduate research experiences (UREs)? Will students' UREs situate them in a position of competitive advantage in a global marketplace? URE allows students to achieve higher-level cognitive and affective learning outcomes such as those described by Anderson & Krathwohl (2001) and Krathwohl, Bloom, & Masia (1964). Further, URE as a pedagogy of engagement offers ample opportunity for teachers to evaluate a student's level of academic preparation. However, there is often a chasm between what is taught in the classroom and what students must demonstrate in order to transition successfully to post-undergraduate endeavors. This presentation explores strategies for holistic and purposeful learning design engineering that scaffolds URE to activate students' competencies (Wiggins & McTighe, 2005; Oxford University Press, 2018). This intentional design approach proposed also argues that lower-level courses have scope and breadth to initiate necessary research skill development and reduce burden of competency building in designated upper-level research courses.

Literature

Anderson, L. W., & Krathwohl, D. R. (Eds.) (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives.* New York: Longman.

Bloom, B. S., Krathwohl, D. R., & Masia, B. B. (1964). *Taxonomy of educational objectives: The classification of educational goals.* New York: Longman.

Oxford University Press: Epigeum (2018). *Research skills, transferable skills, and the new academic imperative.* https://www.epigeum.com/epigeum-insights/news/research-skills-transferable-skills-and-the-new-academic-imperative/

Wiggins, G. P., & McTighe, J. (2005). *Understanding by design.* Alexandria: Association for Supervision and Curriculum Development.

Does research-based learning facilitate the development of research competencies? Results from a pre-post analysis in 74 university courses

Julia Rueß

Humboldt-Universität zu Berlin, bologna.lab

In recent years, research-based learning (RBL) has gained increased attention. It has been suggested that RBL improves a wide array of research-related competencies and is thus recommended to become an integral part of every undergraduate student's experience (Healey & Jenkins, 2009). While there is a growing body of research demonstrating students' developments through participation in RBL (e.g. Deicke, Gess, & Rueß, 2014; Seymour et al., 2004; Taraban & Logue, 2012), further research is needed to support these results and to identify which characteristics of RBL might contribute to students' developments. The purpose of this study was to address these gaps and to examine the effectiveness of RBL with particular focus on RBL in the social sciences. First, relevant research-related competencies were identified by means of expert interviews ($N = 20$), taking into account both cognitive facets of research competence (e.g. methodological knowledge) and affective-motivational facets (e.g. uncertainty tolerance and research interest). In a second step, we administered a pre-post-test in 74 research-based courses with $N = 1.029$ students at 10 German universities and examined whether students' research competencies developed over time. Results show that cognitive competencies increased, whereas most affective-motivational research competencies decreased. However, these overall developments were mediated by individual and course-related factors: whereas the development of cognitive research competencies was influenced by students' prerequisites (e.g. students' highschool grades), changes in affective-mo-

"URE works best when students feel that their lecturer has a strong interest in their work."

tivational competencies where predominantly mediated by characteristics of the course or lecturer. Accordingly, positive changes in students' affective-motivational competencies could be found for those students who perceived the course as particularly useful for a later career or felt the lecturer had a strong interest in their work. In summary, our results suggest that RBL can be effective in fostering students' research competencies, but that this effectiveness depends on individual and course-related factors. Implications for research and RBL instruction are discussed.

Literature

Deicke, W., Gess, C., & Rueß, J. (2014). Increasing Students' Research Interest Through Research-Based Learning at Humboldt University. *Council on Undergraduate Research Quarterly*, *35*(1), 27–33.

Healey, M., & Jenkins, A. (2009). *Developing undergraduate research and inquiry*. *Innovations in Education and Teaching International*. York: The Higher Education Academy.

Seymour, E., Hunter, A.-B., Laursen, S. L., & DeAntoni, T. (2004). Establishing the Benefits of Research Experiences for Undergraduates in the Sciences: First Findings from a Three-Year Study. *Science Education*, *88*(4), 493–534.

Taraban, R., & Logue, E. (2012). Academic Factors That Affect Undergraduate Research Experiences. *Journal of Educational Psychology*, *104*(2), 499–514.

Wolfgang Deicke, M. Phil.

Humboldt-Universität zu Berlin, bologna.lab

"URE advances to higher levels when students have large opportunities for an enculturation process into scientific thinking and practice."

Argumentation and scientific reasoning as didactical means

Prof. Dr.
Ines Langemeyer

Karlsruhe Institute of Technology, Faculty of Humanities and Social Sciences, Department of General Pedagogy

Argumentation and scientific reasoning are strongly interrelated. Scientific reasoning implies thorough reflection on premises and conclusions and their evaluation in the light of scientifically elaborated evidence. According to Deanna Kuhn's work on „Thinking as argument" (1992), to support an argument aptly also means to know how to coordinate theory and evidence without mistakes. As a didactical means, argumentation and scientific reasoning was practiced in an introductory course (sessions took place weekly from October 2018–February 2019) to research methods. The task of finding arguments, to judge what evidence supports a certain argument well and to reflect the scientific principles behind that evidence was used to conduct also research on students' competences (esp. metacognition) and their progress during the course. The results of a questionnaire, a slightly modified and extended version of Kuhn's questionnaire (2018), completed by students (N = 28) in the beginning and at the end of the course, are presented. As the data is originally a set of qualitative data, the translation of this material into a quantitative set of data is laid out and critically discussed, by drawing on Kuhn's approach, in view of different research strategies regarding students' metacognition.

Literature

Kuhn, D. (1992). Thinking as argument. *Harvard Educational Review*, *62*(2), 155–179.

Kuhn, D. (2018). *Building our best future: Thinking critically about ourselves and our world.* Wessex Press.

"In our opinion, URE is successful when students can develop a sound attitude towards research."

Unpacking the black box URE – A holistic analysis on the effects of undergraduate research experience using the example of Humboldt reloaded

Johanna Sand, M. A.

University of Hohenheim, Institute of Marketing & Management, Business Administration: Marketing and Business Development

Anne Maria Stefani, M. Sc.

University of Hohenheim, Institute of Marketing & Management, Business Administration: Marketing and Business Development

Studies on undergraduate research experiences (URE) report on the positive effects on students, teaching staff, and institutions. However, this attribution of positive effects on the target groups often misses an empirical foundation. Despite the intention to carry out an investigation of effects, a number of studies only evaluate URE-initiatives. Furthermore, in the scientific discourse, it seems common sense that URE has certain positive outcomes. The scientific community barely discuses pre-conditions, context factors, negative effects or objective measurements. Our study is facing these aspects by offering a holistic approach. Using the example of Humboldt reloaded, we collect subjective and objective data from participants, and compare them with data from students, which did not make this experience. We chose to focus on students, because many studies on URE refer to teaching staff. In our opinion, ignoring the effects on students excludes the most concerned group of the effects of URE. We start to collect data in 2017 and we will continue the data collection until 2020. So far, the database consists of data from over 247 students from agricultural, natural and economic sciences. Methodologically, we use an online questionnaire to gather subjective data before and after the students participate in Humboldt reloaded. These questionnaires mainly consider questions about the students' competences and their personalities. In addition, we include objective data on students' performance to determine, for example, if URE affects the grades in the semester and the grades of the bachelor thesis. Moreover, we analyze all different Humboldt reloaded projects during the research period based on their official project description and scope, in order to categorize them concerning their extent and their individual expression of URE. Within the analysis, we combine these three data sets of the two groups (participant and non-participant). Since the long-term goal of Humboldt reloaded is the introduction of URE into the curriculum of the University, our study provides a better understanding of the most advantageous projects of the University of Hohenheim.

"URE means to me variable experiences, which have the potential to be life changing but others need to be improved"

Leaving Research: Factors that impact a experience

Dr. Katelyn Cooper

Arizona State University, Postdoctoral scholar in the School of Life Sciences

Participating in undergraduate research is one of the most lucrative activities that a biology student can engage in because of the wide array of benefits that research can provide. Undergraduate research has been shown to increase a student's chance of graduating with a bachelor's degree in science and being accepted into a science graduate program. While researchers are more likely to persist in science than their peers who do not participate in research, there are still many students who participate in research who do not pursue research-related careers. Studies have demonstrated that the length of a student's research experience is a positive predictor of persistence in science, but it is unclear what causes students to persist in their research experiences and what factors cause them to leave their experiences prematurely. In this study, we explored what factors cause students to stay in their research experiences and what factors cause students to leave. We sampled from 26 public R1 universities in the United States and surveyed 768 biology students who had participated in a research experience during the academic year. On the survey students reported whether they had considered leaving or left their first undergraduate research experience. We asked all students who had chosen to stay in research what caused them to stay. We also asked students what caused them to consider leaving or to actually leave their research experiences. We used open-coding methods to identify common themes about why students stay in or leave their research experiences. We used linear regression to explore the relationship between a student's intention to pursue a research-related career in science and whether they never considered leaving, or left their first research experience. We found that students who considered leaving their first research experience but stayed and students who left their first research experience were both less likely to plan to pursue a research-related career in science compared to students who never considered leaving. Students reported that a positive lab environment, positive relationship with their research mentor, receiving sufficient help and guidance, and enjoying their research were key factors that caused them to stay in their research experiences. Conversely, students reported that insufficient guidance, a negative relationship with their mentor, disinterest in their research, and personal time constraints caused them to leave their research experiences. This study provides important insight into what we as mentors can do to help retain biology students in their undergraduate research experiences.

"URE is a fascinating object of investigation. In the context of teacher education it seems to offer a high potential to build bridges between the worlds of educational practice and educational science. Two fields that are not yet as complementary as I wish them to be."

„Research-based learning is more than a course" – A pilot study on the effect of research-based learning on student teachers' beliefs of the practical relevance of research and their knowledge to evaluate evidence

In preparation of an evidence-based practice, student teachers need knowledge of scientific-empirical methods and beliefs that research findings are relevant to practice (Stark, 2017; Zeuch & Souvignier, 2015). Research-based learning seems to provide adequate learning opportunities, since it offers experiences with research on authentic problems in the school context and its aim is to promote research competence which is relevant for evaluating evidence adequately. The aim of this study was to pilot a research-based course in teacher education and to investigate the subsequent questions. Does the participation in a research-based seminar (RB) increase the knowledge to evaluate evidence (H1) and does it influence student teachers' beliefs that research findings are relevant to practice (H2) in comparison to a control seminar? In an intervention seminar (RB seminar, 10 Master of Education students, 90 % female, semesters: M = 2.63), small groups of students went through a complete research process and investigated real questions of schools that had been identified together beforehand. In a research-oriented control seminar (19 Master of Education students, 100 % female, semesters: M = 2.95), methods of social research were instructed directly and practiced. The effects of the RB seminar were examined with regard to beliefs of the practical benefits of science and research ($\alpha = .83$) and knowledge to evaluate evidence ($\alpha = .64$) (Zeuch & Souvignier, 2015). Overall, both groups were found to be more competent in evaluating evidence after the seminars (main effect 'time': $F(1, 27) = 5.14$, $p = .032$, $\eta p2 = 0.16$). However, only the RB students changed their beliefs and regarded the value of science and research for practice more positively than the control seminar (interaction effect 'group x time': $F(1, 27) = 4.36$, $p = .047$, $\eta p2 = 0.14$). The current results are supplemented by interviews and the sample will be increased until the congress.

Literature

Stark, R. (2017). *Probleme evidenzbasierter bzw.-orientierter pädagogischer Praxis.* Zeitschrift für Pädagogische Psychologie, 31(2), 99–110.

Zeuch, N., & Souvignier, E. (2015). *Zentrale Facetten wissenschaftlichen Denkens bei Lehramtsstudierenden. Entwicklung eines neuen Instruments und Identifikation von latenten Profilen.* Unterrichtswissenschaft, 43(3), 248–266.

Norbert Graebel, M. A.

University of Erfurt, Educational faculty

"URE means to me bringing higher education back to its roots."

Research-based learning in the student life cycle – a panel study at the University of Oldenburg

Dr. Susanne Haberstroh

University of Oldenburg, Presidential Department for Study Affairs

Dr. Janina Thiem

University of Oldenburg, Presidential Department for Study Affairs

At the University of Oldenburg, research-based learning is to be developed as part of the teaching profile. It serves to promote analytical, methodological and reflexive skills and thus contributes to the students' scientific and professional competence development. However, there are few empirical findings on how research-based learning affects the competence development of students in the course of their studies. To close this gap, we started a panel study on research-based learning at the University of Oldenburg (April 2018), in which students have been and will be surveyed several times on research activities during their studies. The aim is (1) to gain insights into when students come into contact with research activities and (2) how they assess the development of their own research competence over time. The survey design is based on a theoretical model of competence acquisition through research-based learning, in which not only different cognitive dimensions of research competence, but also affective-motivational facets are taken into account. In addition, we will examine how the curriculum is reflected in actual study behavior. The panel design allows quasi-experimental comparisons to be carried out on the basis of intra-individual changes, thus reducing the uncertainty with which causal statements can be made. The survey will be conducted among bachelor's and master's students of the same year from their first semester until the end of their standard period of study – at the beginning of each semester, looking back on the previous semester. The panel study allows for the first time insights into research-based learning over the entire student life cycle on an intra-individual level. This poster presents the evaluation design, the first results from waves 1 (N = 813) and 2 (N = 626) and the challenges of the panel survey.

"Undergraduate Research Experience – the opportunity for undergraduates to dig into own interests while experiencing the 'ups' and 'downs' of a research process."

Targets of Undergradute Research – Research results of the FideS-Project

While research-based learning is an approach often used to promote students' scientific education, there is a lack of evidence on the objectives that Higher Education institutions want to achieve through the students' exposure to research, especially in early stages of the study career. What are the reasons behind the early contact with research? Which aims do Higher Education institutions pursue with undergraduate research? FideS is a joint project of the University of Hamburg, the University of Potsdam and the Technical University of Kaiserslautern. It investigates the initiation and implementation of research orientation in the first year of studies in QPL projects as well as beyond. In total, 19 projects for case studies were identified in a three-stage procedure. Hints on underlying targets were found in 17 projects. In this poster, we use program theory as a means to identify goals on different levels, specifically Bewyl's programme tree of evaluation. This model was chosen because of its goal system which allows for different levels of goals to be connected in a cause-effect relation. Our analysis resulted in four target systems for undergraduate research that are further divided into different objectives: student graduation, curricular coherence, scientific education and selection. Within these target systems, we find many interconnections but also contradictions between particular goals. The results have been published in the following literature:

Lübcke, E., Heudorfer, A. (2019). *„Die Ziele forschenden Lernens: Eine empirische Analyse im Rahmen der QPL-Begleitforschung"*.

Reinmann, G. Lübcke, E. Heudorfer, A. (Hrsg.), *Forschungsorientierung in der Studieneingangsphase.* SpringerVS. Wiesbaden. S. 17–58.

FideS is a BMBF funded 'QPL-Begleitforschungsprojekt'. For further information visit: www.fides-projekt.de.

Jennifer Preiß, M.A.

Hamburg University, Hamburg Center for University Teaching and Learning (HUL)

„URE means to me … Understanding, Reflexivity and Emancipation“

Research-based learning in teacher education: The development of a tool measuring beliefs about reflective teaching practice

Dr. Constanze Saunders

Humboldt-Universität zu Berlin, Professional School of Education

Research-based learning plays a central role in teacher education. It supports content learning and the teaching of a self-reflexive attitude towards teaching practice. Through theory-based research in student research projects, teacher candidates are given the opportunity to develop a self-reflexive attitude or to constructively change existing attitudes. It is still unclear to which extent research-based learning actually promotes this reflective attitude and which teaching principles of research-based learning are effective for this objective. In order to be able to investigate this, a suitable measuring instrument was developed at Humboldt-Universität zu Berlin. The poster presents this instrument with which student opinions on the role of 1) reflection in general, 2) educational theories and 3) their own research for teaching practice can be empirically assessed. Using this instrument, changes in attitude can be researched on a long-term basis and tied back to learning elements in the research-based teaching formats. The items of the scales were developed based on existing theories and scales and validated with the help of statistical methods (cf. Saunders, Gess & Lehmann, acccepted). The instrument is used at Humboldt-Universität zu Berlin, researching the impact of research-based learning in teacher education. Therefore, in addition to the theoretical basis and the scale design, selected results from the impact studies will be presented on the poster.

Literature

Saunders, C., Gess, C. & Lehmann, M. (accepted). *Forschendes Lernen im Lehramt: Entwicklung eines Instruments zur Erfassung von Überzeugungen zur forschend-reflexiven Lehrpraxis.“* In: C. Wulf, S. Haberstroh & M. Petersen (Hrsg.). Forschendes Lernen – Theoretische Grundlagen und empirische Befunde. Zum Stand der Diskussion. Wiesbaden: Verlag für Sozialwissenschaften.

"URE means to me … to meet like-minded colleagues and improve my knowledge in undergraduate research."

The Zeppelin Project. Undergraduate research at Zeppelin University

The Zeppelin Project is a module in the first and second semester of study, which is obligatory for all undergraduate study programs at Zeppelin University. As part of this module students must develop a research question within small groups and elaborate this question by using scientific theories and methods. During the conceptualization and implementation of the research project students will be monitored by lecturers of introductory courses and method workshops. Each group will also be intensely supported by an academic supervisor. Furthermore, the Zeppelin Project is designed as a interdisciplinary module. Within the introductory courses all students receive input from a political science, economics, sociological as well as communication and cultural science perspective embedded in the annual motto of the Zeppelin Project. Within their research projects students are free to decide if they want to elaborate their research question in a subject-specific or multidisciplinary way. The resume of our six-year experience with the Zeppelin Project in the field of undergraduate research within the orientation phase of the study is as follows: The high effort for students as well as for lecturers perhaps does not pay off immediately. But positive effects on autonomous scientific working and the deliberate design of the further study can be perceived in the course of studies.

Dr. Christian Zettl

Zeppelin University, Friedrichshafen, Politics, Administration & International Relations | PAIR

Hohenheim Memorandum

Project descriptions

Systems of higher education

Register

Hohenheim Memorandum

Research-based learning is demanding – and it's worth it!

Research-based learning has been a significant postulate of the academic reform for 50 years. The conference provides an opportunity to discuss the aspirations involved, and to take stock. It is intended to generate impulses for the further development by the memorandum that will be introduced at the end of the conference.

Higher education landscape: Grown, more diverse

With the publication "Forschendes Lernen – Wissenschaftliches Prüfen" (BAK, 1970), research-based learning was launched in the German language area. The publication has been formative for the debate until today. The higher education landscape, however, has changed considerably. It has become more diverse, and more international. Competition and profiling are becoming increasingly significant. This is reflected in a transformed governance of universities. "Unity of teaching and research" or "Education by science" have remained guiding principles of the university self-conception. However, the concrete realization has to be rethought – not least because of the tremendous increase in student numbers and the changed modes of knowledge production.

Studies: New structures, new questions

Due to the Bologna Reform, significant changes in the study structure were established, and it was aimed at European harmonization. Along with this process, crucial questions were posed to the course of studies: questions concerning the acquired competencies, the professional relevance ("employability"), or the international dimension. According to various education policy documents and reports, research-based learning is seen as a way to answer such questions. However, there is need for taking steps on the individual, curricular, university and higher education policy level to realize the potential of research-based learning fully and sustainably.

Underpinnings

Requirements

Effects

Memorandum: Our intention

The memorandum intends to introduce basic considerations on further development of research-based learning to the current debate in succinct manner. Both insights of the conference and unfulfilled postulates from previous years shall be taken up. The memorandum strives for stimulating the further development. Recommendations for action address different actors of higher education.

We are looking forward to our discussions on research-based learning at the conference.

Furthermore, we would appreciate to continue the discussion on the postulates and the recommendations for action beyond the conference.

We hope we can count on your support to disseminate the Hohenheim Memorandum as an important higher education policy signal for the consistent promotion and sustainable implementation of research-based learning.

Dr. Cornelia Frank

Prof. Dr.
Philipp Pohlenz

Prof. Dr.
Peter Tremp

UNIVERSITY OF HOHENHEIM

Humboldt reloaded – Undergraduate Research integrated into Bachelor Curriculum at Hohenheim University, Germany

University of Hohenheim
Faculties of Agricultural, Natural, Business, Economics and Social Sciences

Funding
Federal Ministry for Education and Research: Teaching Quality Pact
Funding period: Oct 2011 - Dec 2020
Grand: 16,000,000 Euro

SPONSORED BY THE

Federal Ministry of Education and Research

uhoh.de/humboldt-reloaded

FideS – research-based learning in the introductory phase of studies

FideS began as a research project on beneficial and inhibiting conditions for research-based learning in the first three semesters of university studies.

Now the main target is developing didactic tools and training material that are rooted in our empirical findings. Our tools support co-ordinators of research-based learning projects in training academic staff to create undergraduate research experiences.

An additional focus of our current efforts lies in the challenges concerning digitization and evaluation of research-based learning.

If you are interested in trying these tools (and helping us improve them), please feel free to contact us for more information. We offer workshops on our tools and are happy to present results of our research (e. g. a systematic description of goals of undergraduate research).

Hamburg Center for University Teaching and Learning (HUL) | www.fides-projekt.de |

Funded by the Federal Ministry of Education and Research (BMBF) (01PB18013)

Verbundprojekt ForschenLernen

ForschenLernen was a federally funded joint research project by FH Potsdam (FHP), Humboldt-Universität zu Berlin (HUB) and Ludwig-Maximilians-Universität Munich (LMU) in co-operation with 13 other German HEIs (Grant No. 01PB14004).

In five sub-projects, we examined how research-based learning (RBL) was defined and offered in German HEI‘s (FHP); how students learn in and through RBL (FHP); the effects RBL has on the development of students‘ research competencies in the social sciences (HUB); how RBL affects students‘ scientific reasoning and argumentation skills (LMU); and the impact institutional contexts have on the organisation of RBL (FHP). First project findings were presented at an international conference (www.inhere2018.de) in Munich in March 2018 and several PhD theses from the project (Teresa Stang, Katrin Rubel, Insa Wessels, Diana Ouellette) are nearing completion.

Contacts:
FHP: Prof. Dr. Harald Mieg, harald.mieg@hu-berlin.de
HUB: Wolfgang Deicke, wolfgang.deicke@hu-berlin.de
LMU: Dr. Jan Zottmann, jan.zottmann@med.uni-muenchen.de

SPONSORED BY THE
Federal Ministry of Education and Research

Clearinghouse
Forschendes Lernen

Evidence-Based Design of Research-Based Learning Projects (EviG-FL)

EviG-FL is the bologna.lab's follow-up to the research project "ForschenLernen" at Humboldt-Universität (Grant No. 01PB14004/B).

The aim of this transfer project is to examine the findings of "ForschenLernen" and other empirical studies on research-based learning (RBL) for their implications for teaching and instructional design. The project comprises of two measures:

1) A Clearinghouse for empirical findings on the effects of RBL that aims to summarise these studies and draw out their implications for teaching for HE teaching staff and educational trainers;
2) A collection of OER training materials, methods and case studies developed and tested by the RBL community of practice. The online Clearinghouse will go live in Autumn 2019 and a series of dissemination workshops is planned from late 2019-2020.

Contact: Wolfgang Deicke, Julia Rueß, Insa Wessels, Kathrin Friederici & Yasemin Gülez
bol-forschung@hu-berlin.de

NEUE LEHRE – NEUES LERNEN
BOLOGNA.LAB

SPONSORED BY THE
Federal Ministry of Education and Research

dghd
Deutsche Gesellschaft für Hochschuldidaktik

AG Forschendes Lernen in der dghd

(**AGFL** - Standing Group for Research-Based Learning in the German Association for educational and academic staff development in Higher Education (dghd))

The dghd's Standing Group on Research-Based Learning (AGFL) was set up in 2014 as an informal network of Higher Education teaching staff, researchers, trainers and projects with an interest in research-based learning. The network currently comprises 117 active members from 52 Higher Education Institutions. Its primary aim is to disseminate information and facilitate discussion around research-based learning. The network meets at least twice a years to discuss and work on pre-determined issues and topics. It runs a website (in German) and a Working Paper series that accepts submissions in German and/or English. Members of the AGFL have been involved in organising the German conference for student research (#stuko) since 2016 and were successful in securing federal funding for research into the effects of research-based learning (-> FideS -> ForschenLernen).

agfl_dghd@mail | https://www.dghd.de/community/arbeitsgruppen/ag-forschendes-lernen/

Working Paper of the standing group on research-based learning in the dghd*

(*German Association for Educational and Academic Staff Development in Higher Education)

The Working Paper series is an online publication by the University of Oldenburg and is geared towards everyone interested in research-based learning. The series publishes research papers as well as practice-based studies about research-based learning. Paper authors do not have to be members either of the dghd or the Working Group to have their papers considered for publication. Submissions are welcome both in German and English. All submissions undergo a double blind peer review process. Submissions are welcome at all times (there is no fixed deadline).

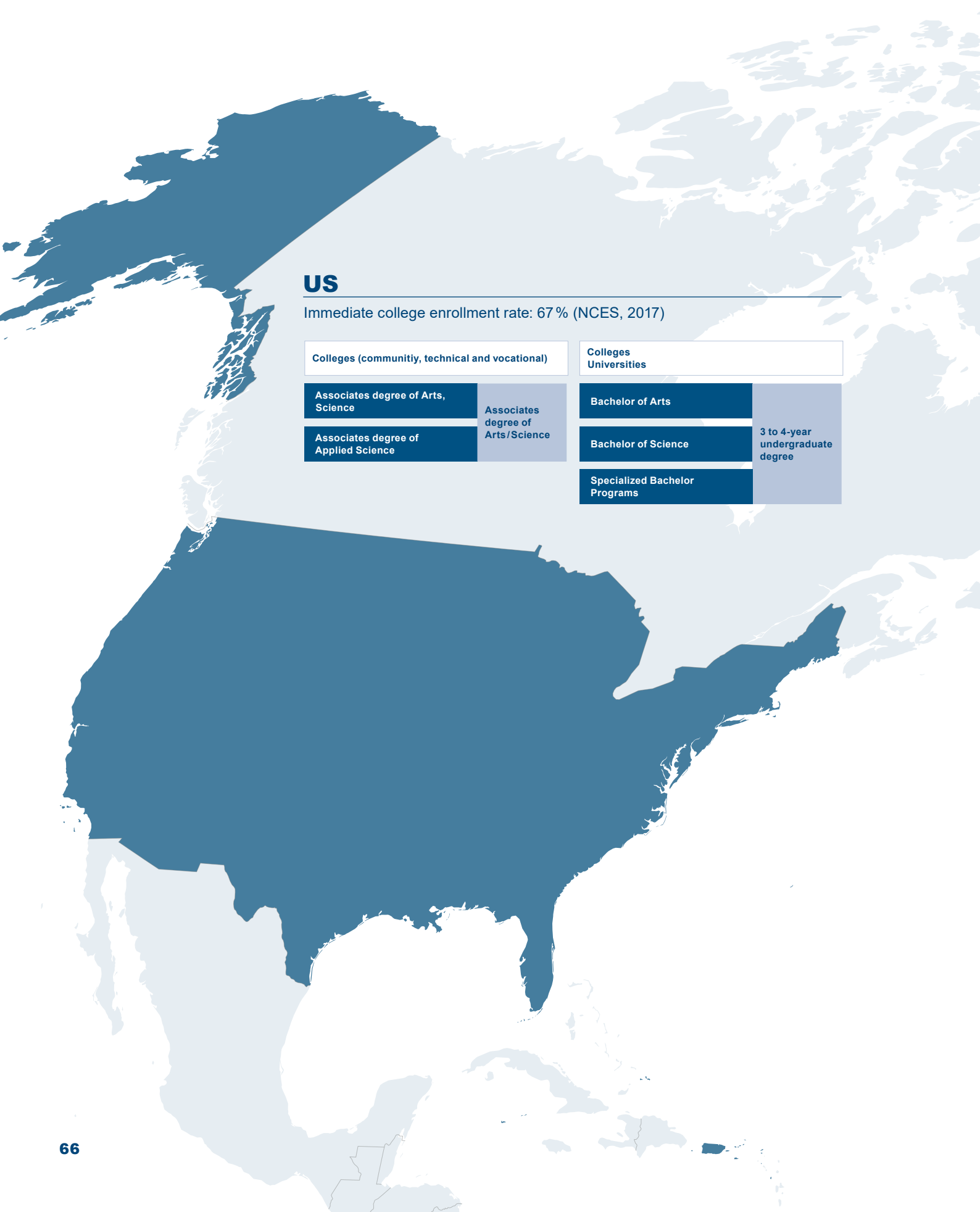
fl-workingpaper@uol.de | www.uol.de/fl-workingpaper

2nd World Congress on Undergraduate Research (World CUR 2019)

The World Conference for Undergraduate Research (World CUR) is an international congress for student research. It was launched in Qatar in 2016. The second WorldCUR was hosted by University of Oldenburg (Germany) from 23.-25.05.2019. More than 300 undergraduate students from 36 countries presented their research results, connected with fellow researchers and made their first congress experiences.

www.uol.de/worldcur2019

Systems of higher education at a glance



US

Immediate college enrollment rate: 67 % (NCES, 2017)

Colleges (communitiy, technical and vocational)		Colleges Universities	
Associates degree of Arts, Science	Associates degree of Arts/Science	Bachelor of Arts	3 to 4-year undergraduate degree
Associates degree of Applied Science		Bachelor of Science	
		Specialized Bachelor Programs	

NL

Immediate enrollment rate: 40 % (OECD, 2014)

Universities	3-year undergraduate degree	Bachelor of Arts
		Bachelor of Science
		Bachelor of Laws
Universities of Applied Sciences	4-year undergraduate degree	Bachelor of Arts Bachelor of Science Bachelor of Laws Bachelor of Business Administration Bachelor of Social Work Bachelor of Education Bachelor of Music

UK

18-year olds entering university: 33,3 % (Universities UK, 2018)

College → Prepare for → Universities

3-year undergraduate degree (Scotland: 4-year degree)	Bachelor of Arts
	Bachelor of Science
	Bachelor of Education
	Bachelor of Engineering
4-year undergraduate degree	Foundation degrees (classes related to employment), SVQ, NVQ, Higher National Diploma HND (or equivalent) → are linked to a particular profession in social work or medicine such as nursing; NHC (or equivalent) etc.
Fast tracks program	Bachelors can gain a Masters degree

DE

Immediate enrollment rate: 59 % (Statista, 2019)

Universities	3 year undergraduate degree	Bachelor of Arts
Universities of Applied Sciences		Bachelor of Science
Colleges of art & music		Bachelor of Engineering
Specialized insitutions		Also: Bachelor of Laws Bachelor of Fine Arts Bachelor of Music Bachelor of Musical Bachelor of Education

CH

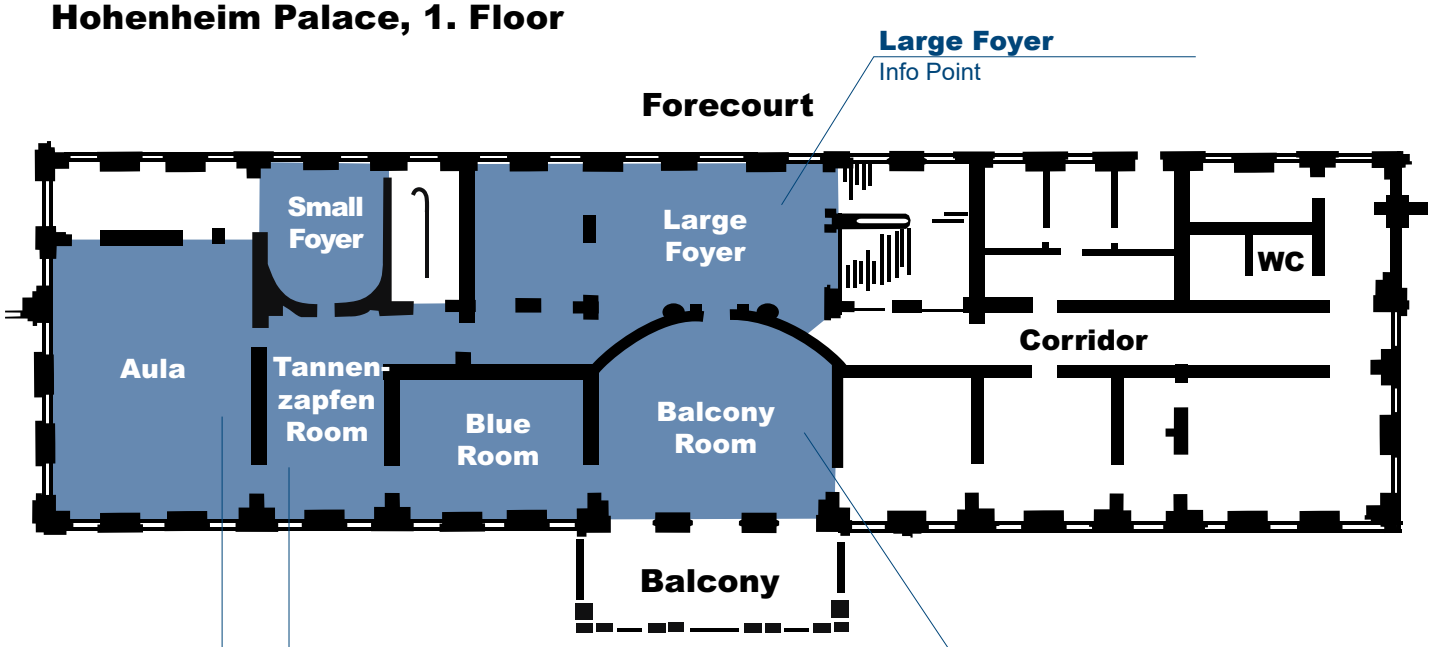
Immediate enrollment rate: 37 % (OECD, 2014)

Universities and Federal Institutes of Technology	Baccalaureate	3 year undergraduate degree
Universities of Teacher Education	Baccalaureate	
Universities of Applied Sciences	Federal Vocational Baccalaureate, Specialised Baccalaureate	
Colleges of higher vocational education and training	Practically oriented certificate and diploma	

Register of persons

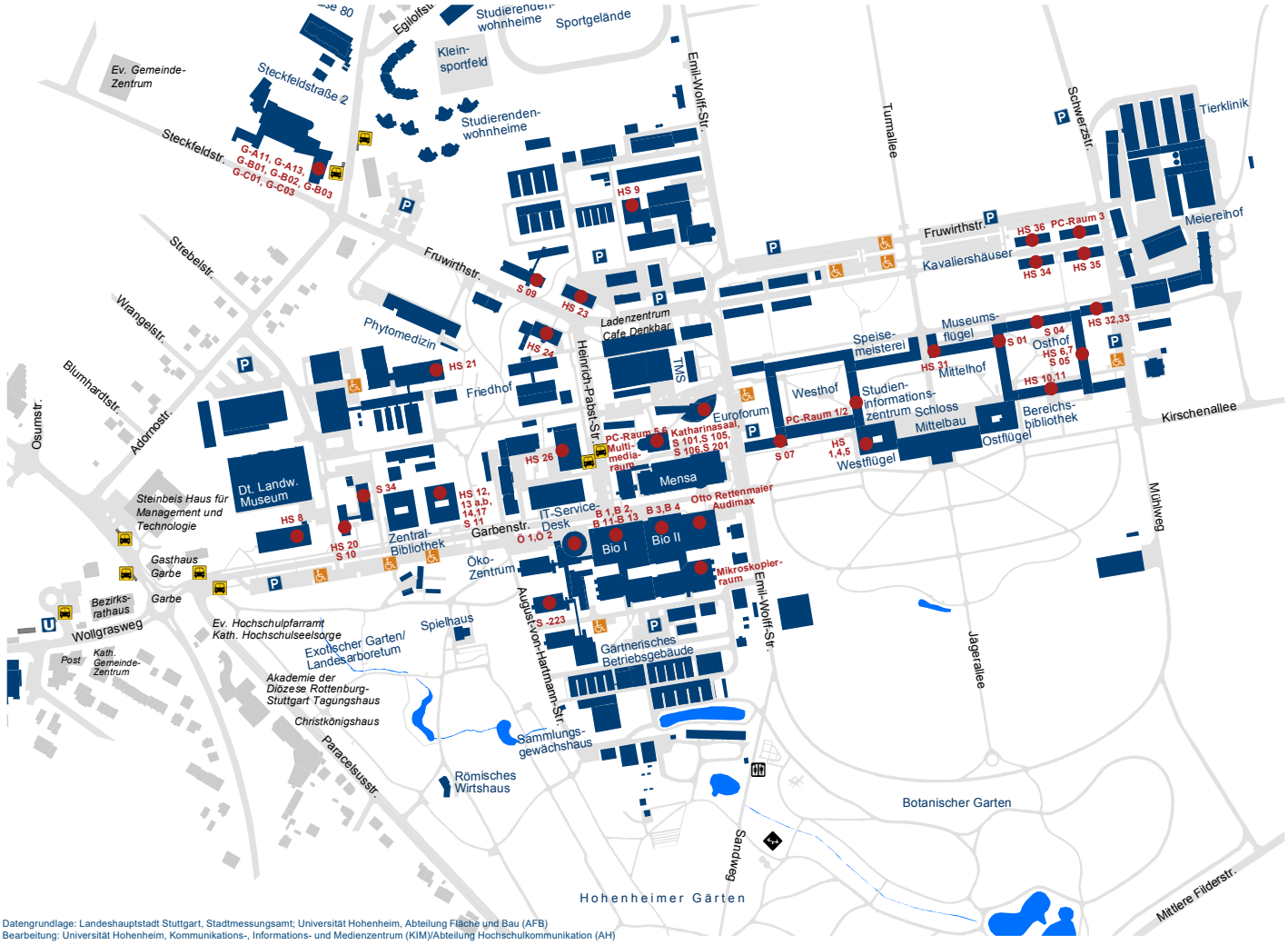
Keyword register

Hohenheim Palace, 1. Floor



Humboldt reloaded | University of Hohenheim
Garbenstraße 30 | 70593 Stuttgart | Germany
T +49 711 459 23764 | **E** focus_URE@uni-hohenheim.de

Campus map



Datengrundlage: Landeshauptstadt Stuttgart, Stadtmessungsamt; Universität Hohenheim, Abteilung Fläche und Bau (AFB)
Bearbeitung: Universität Hohenheim, Kommunikations-, Informations- und Medienzentrum (KIM)/Abteilung Hochschulkommunikation (AH)

#focusUREconf
www.uni-hohenheim.de/humboldt-reloaded